

ing this volume. It is, we believe, the first treatise in English which has fully utilised the remarkable archæological discoveries of the last decade in Mediterranean countries, and the author is to be congratulated on the thoroughness and ability with which he has accomplished his task. J. G.

BOTANICAL PHOTOGRAPHS.

Vegetationsbilder. Seventh series. Parts iii. to viii. Part iii., *Der nördliche Schwarzwald*, by Otto Feucht; part iv., *Vegetationsbilder aus Dalmatien*, by L. Adamović; part v., *Charakterpflanzen des abessinischen Hochlandes*, by Felix Rosen; parts vi. and vii., *Pflanzenformationen aus Ost-Bolivia*, by Th. Herzog; part viii., *Vegetationsbilder aus Dänisch-Westgrönland*, by M. Rikli. Price 4 marks, each part containing 6 photographs. Edited by Prof. G. Karsten and Prof. H. Schenk. (Jena: Gustav Fischer, 1909-10.)

THIS unique botanical publication is being continually extended, so that a seventh series is now completed. The first double part of the volume, dealing with the colonisation of volcanic lands in Java and Sumatra, has been previously noticed. The third part is devoted to the vegetation of the northern area of the Black Forest, which is characterised by its coniferous trees and moorland. A typical bit of high moor shows bushes of *Pinus montana*, clumps of *Scirpus caespitosus* and tufts of *Juncus squarrosus*. On another plate the same pine is seen as a tall tree, contrasting with the adjacent Scots pine and spruce. The author has also been very successful with his representations of the two subalpines, *Andromeda polifolia* and *Athyrium alpestre*, and of the umbellifer, *Meum athamanticum*. Dr. L. Adamović has brought together a most attractive set of photographs from the sunny climate of Dalmatia. They illustrate a strip of shore and rocks of the littoral, sublittoral and montane regions. So carefully have the spots been chosen and the photographs taken that the author can point out most of the individual plants. Especially charming is the first plate, showing *Aster Tripolium* with species of *Statice* and *Inula crithmoides* on the shore, and the second picture of sublittoral rock where *Dianthus dalmaticus* and *Iris germanica*, with other plants, are easily recognised. Trees provide the chief feature of the views on the Abyssinian plateau. The rosaceous plant *Hagenia abyssinica*, which tardily assumes its arboreal shape, is very striking; the unripe fruits are esteemed by the natives as a valuable specific for internal complaints. A fine specimen of tree Euphorbia is depicted, which the author suggests may have developed an arboreal form when it passed from a dry to a moist climate. Even more singular is the tree *Lobelia*, formerly known as *Rhynchopetalum*. Illustrations are also given of a huge spreading *Ficus* and a tree *Entada*.

Dr. Th. Herzog has provided a fine double part relating to the remote territory of East Bolivia. Along the Paraguay, on savannah land subject to inundations, is the home of the wax palm, *Copernicia cerifera*, where it is associated with tall grasses, species of *Paspalum* and *Andropogon*. Another plate represents

the growth of the palm *Acrocomia Totai*, on the sandstone highlands of Chiquitos. A "monte" or thicket formation occurs on parts of the plain of the Rio Grande, where thorny scrub and succulents predominate; the plates depict species of *Cereus*, a *Trithrinax* and the bromeliad *Aechmea polystachya*, which last is valuable to travellers, as it generally holds a store of water. Other palms selected for illustration are *Orbignya palmata* and *Mauritia vinifera*, typical of the savannahs, *Astrocaryum Chonta* and *Iriartea exorrhiza*, denizens of the rain forests; *Iriartea* produces remarkable thorny prop roots. The last two plates portray succulents, of which *Pilocereus celsianus* is the most striking, on account of its silvery crown of hairs.

The concluding part contains some typical aspects of vegetation in Danish West Greenland. In the southern area birches alone attain to the height of trees as seen in the first plate; the second indicates the importance of *Salix glauca*. A brilliant photograph of an Arctic meadow would be better appreciated if a key to the plants had been supplied. There is an effective photograph of cotton-grass growing by the edge of a lake, and another of clumps of *Glyceria distans* which attract attention on account of the peculiar lie of the stems.

MAGNETIC CHARTS.

Magnetische Kartographie in historisch-kritischer Darstellung. By G. Hellmann. Veröffentlichungen des Kg. Preuss. Meteorologischen Instituts, Abhandlungen, Bd. iii., Nr. 3. Pp. 61. (Berlin: Behrend and Co., 1909.) Price 6 marks.

DR. G. HELLMANN, as head of the Prussian Meteorological Institute, which controls the magnetic observatory at Potsdam, and as a lover and collector of antique magnetic literature, is conspicuously qualified for the work he has undertaken in the present volume. It aims at giving a complete list of all magnetic charts of any importance. All time prior to the year 1700 is regarded by Dr. Hellmann as preceding the era of charts, but he devotes a few pages to Columbus and other pioneers, whose work relates to the discovery that the magnetic needle is usually inclined to the geographical meridian.

Time since 1700 is divided into two periods. The first, extending until 1835, was heralded in by the famous chart of Halley; it is briefly discussed on pp. 10-11. The second period, extending from 1835 to the present day, saw the introduction of magnetic surveys on land.

The earliest work of this kind, according to our author, took place in England on the initiative of the British Association. On pp. 11-17 there is an enumeration of all the principal land surveys; while pp. 18-27 summarise the present state of our knowledge of the distribution of the magnetic elements. There is a useful list on p. 26 of the epochs of the principal surveys since 1891, with particulars as to the number and density of distribution of the stations. A number of propositions are laid down in pp. 28-29 as to the objects to be aimed at in magnetic surveys and other work preliminary to the construction of

charts. The author considers it most important that the exact observational work at sea commenced under the auspices of the Carnegie Institution should be extended as soon as possible to all seas. He advocates international cooperation to ensure continuity in the drawings of magnetic lines in frontier districts, and emphasises the importance of adequate determinations of secular change.

The terminology, units, &c., employed in the description of the charts are explained in pp. 30-31. The charts themselves are divided into those dealing with the whole or the greater part of the earth, those confined to the oceans, those dealing with the several continents, and, finally, those devoted to individual countries or districts. The information given usually includes the area, the epoch, the magnetic element or elements dealt with, the interval—in specified units—between the successive isogonal, isoclinal, or isomagnetic lines, the geographical scale of the map, also the locus and date of publication. The title in each case, when there is one, is given in the original language. There is a separate list on pp. 60-61 of charts based on theory.

The list of charts seems very complete. As evidence that it is up to date may be mentioned the fact that it includes the British and American world charts published respectively in 1906 and 1907, Commander Chetwynd's charts of the South Polar regions published in 1908, Dr. Schmidt's charts of North Germany, and Prof. Beattie's South African charts published in 1909. The volume is clearly printed in good-sized type, and should prove a valuable work of reference.

C. CHREE.

ELECTRICAL BIOGRAPHY.

Makers of Electricity. By Brother Potamian and Prof. James J. Walsh. Pp. vi+404. (New York: Fordham University Press, 1909.)

THIS is not a work on central-station engineers, but a series of biographical sketches of the chief pioneers in the science of electricity in its historical development. Of these sketches there are twelve, as follows:—Peregrinus and Columbus; Norman and Gilbert; Franklin and some of his contemporaries; Galvani; Volta; Coulomb; Oersted; Ampère; Ohm; Faraday; Clerk Maxwell; Lord Kelvin. As the first three, together with those on Oersted and Lord Kelvin, are signed by Brother Potamian, it may be assumed that the rest are by his colleague, Dr. Walsh, who is the author of several others works, "Makers of Modern Science," "Catholic Churchmen in Science," "Makers of Modern Medicine," and "The Popes and Science," which appear to have a great vogue amongst Roman Catholic readers in the United States. Brother Potamian, better known to his English friends as Dr. O'Reilly, is one of those who has made the bibliographical history of electricity his own; and his masterly annotations of the catalogue of the Wheeler collection of electrical books (formerly the library of the late Mr. Latimer Clark) in the possession of the American Institute of Electrical Engineers show him to possess abundant qualifica-

tions for writing biographies of the pioneers. If the chapters on Peregrinus and Columbus, Norman and Gilbert, add nothing to previous knowledge, they are valuable in presenting very readable summaries of the results of recent antiquarian research into the achievements of these early investigators of magnetism. The account of Peregrinus is particularly good, and avoids errors too often attaching to accounts of his long-forgotten discoveries. The article on Gilbert is also replete with the details which have been unearthed in recent years, though by a slip on p. 49 he is said to have blamed Stevinus for certain "vain and absurd" views about the variation of the compass in southern regions of the earth. It was not Stevinus whom he blamed, but "certain unnamed Portuguese mariners." Gilbert's Copernican views are discussed fully, and criticised.

Franklin's work in electrical observation is treated at some length, as is natural in a work intended primarily for American readers; but all readers should be grateful for the very clear way in which Brother Potamian has laid out the historical position of Franklin with respect to those contemporaries of his—De Romas, d'Alibard, and Divisch—who have been alleged to have anticipated him with respect either to the kite experiment or the invention of the lightning rod. One amusing reminiscence is recorded in this chapter of the controversy which arose upon knobs *versus* points, and was referred to a committee of the Royal Society. In that committee the Hon. Henry Cavendish and Dr. Benjamin Wilson were opposing partisans. Sir John Pringle, the President of the Royal Society, supported Cavendish in favour of using points. But points had been advocated by Franklin, whom to support at that moment was "unpatriotic." His Majesty George III. accordingly ordered that the points of the lightning conductors at Kew Palace should be replaced by balls; whereupon Sir John Pringle, replying with dignity, "Sire, I cannot reverse the laws and operations of nature," resigned the presidency. This evoked the following witty epigram:—

While you, great George, for knowledge hunt,
And sharp conductors change to blunt,
The nation's out of joint;
Franklin a wiser course pursues,
And all your thunder useless views
By keeping to the point.

The chapters devoted to Galvani and to Volta call for little comment. That on Coulomb gives a better biography than is accessible in English elsewhere. Those on Oersted, Ampère and Ohm are each good in their way; but that on Ohm lacks proportion. One might think that the whole of mathematical physics began and ended with Ohm's "Law."

The lives of Faraday, Clerk Maxwell, and Lord Kelvin are compiled with a knowledge and sympathetic comprehension. The one phrase to which one must take exception in the account of Lord Kelvin is the suggestion—*apropos* of Lord Kelvin's saying at his jubilee that the most strenuous of his efforts for the advancement of science had ended in "failure"—that "because Dame Nature did not open to his